The Early Aurignacian in Central Europe and its Place in a European Perspective

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ABSTRACT This paper places the current research on the Aurignacian of the Upper and Middle Danube region in a broader European context. Technological and typological studies show that the Swabian Aurignacian, particularly as documented in the well-dated deposits from Geißenklösterle, closely resemble the assemblages of Peyrony's Aurignacian I. We use the term Early Aurignacian in this context to distinguish the well-documented Swabian assemblages including Geißenklösterle, Hohle Fels, and Vogelherd from other early Upper Paleolithic cultural groups including the Proto-Aurignacian of southern Europe. Although the assemblage from Willendorf II, layer 3, is very small, it also appears to belong to the Early Aurignacian. The early phases of the Aurignacian date to about 35 000 radiocarbon years ago and about 40 000 calendar years ago based on TL measurements. These dates indicate a great antiquity of the upper and middle Danubian Early Aurignacian, but similar radiocarbon ages are also known from the Early Aurignacian of the Aquitaine region. Thus, for now, questions about the poly- or monocentric origin of the Aurignacian remain open. The available data, however, do not support the claims for an origin of the Aurignacian in the Balkans or other regions of eastern Europe.

Introduction

Questions related to the first Aurignacian are of critical importance in the debate on the appearance and spread of anatomically modern humans and culturally modern behaviour in Europe. While it is often assumed that the Aurignacian is equivalent to the first dispersion of modern humans in Europe (e.g. Mellars, 1989, 1996a, 1996b, 2004; Otte, 1990, 1996; Kozłowski, 1993; Bar-Yosef, 1998; Zilhão and d'Errico, 1999; Kozłowski and Otte, 2000; Davies, 2001; Conard and Bolus, 2003), no consensus exists regarding the spatial distribution and the archaeological definition of the first Aurignacian. This question is nevertheless crucial in the debate since several scholars view the Aurignacian as a homogeneous, pan-European, cultural event reflecting a migration of modern humans from East to West across western Eurasia (e.g. Djindjian, 1993; Mellars, 1989, 2004; Bocquet-Appel and Demars, 2000; Kozłowski and Otte, 2000). This alleged cultural homogeneity associated with global technical, economic and symbolic signatures has led to the interpretation of the Aurignacian as the cultural and biological European revolution of the Upper Pleistocene (Mellars, 1989, 2004; Bar-Yosef, 1998). More particularly, based especially on assemblages such as Bacho Kiro layer 11 (Kozłowski, 1982, 1999) and Temnata TD-I, layer 4, Bulgaria (Ginter et al., 1996; Drobniewicz et al., 2000), some researchers argue that the European Aurignacian first appears in the Balkans (Kozłowski and Otte, 2000). Through the years, researchers have suggested an east to west movement of the Aurignacian along the Danube Valley as one of the routes followed by modern humans into Europe (Mellars, 1989, 1996a, 1999; Djindjian, 1993; Kozłowski, 1993; Bar-Yosef, 1998). Radiocarbon and TL dates between 40 and 35 kyr BP from German, Austrian and Hungarian Aurignacian strata strongly support this scenario

leading to the "Danube corridor hypothesis" raised by the Tübingen research group (Conard, 2002; Conard and Bolus, 2003; Bolus, 2004).

Since central Europe is of major importance for explaining the appearance and spread of the Aurignacian in Europe, it is necessary to test the idea of cultural unity of the Aurignacian through detailed technological studies of material culture. In this paper, we focus our attention on the evidence from central Europe.

The case of Geißenklösterle

The Geißenklösterle sequence has been considered as the most serious candidate for the presence of a very early Aurignacian in central Europe (Hahn, 1988, 1995a; Zilhão and d'Errico, 1999, 2003a, 2003b; Kozłowski and Otte, 2000; Richter et al., 2000; Bolus and Conard, 2001; Conard and Bolus, 2003). Indeed, the lowest layers of the sequence (IIIb, IIIa and III) yielded five radiocarbon dates, both AMS and conventional, falling into the range between about 36.5 and about 40 kyr BP. Moreover, six TL dates obtained by Richter et al. (2000) on burnt flints provide a mean age of 40.2±1.5 kyr BP, while two TL dates on burnt flints for the upper Aurignacian horizon (AH II) yielded ages of ca.37 kyr BP.

Debates on the chronostratigraphy and taphonomic context of the Aurignacian of Geißenklösterle highlight diverse points of view (e.g. Zilhão and d'Errico, 1999; Kozłowski and Otte, 2000; Richter et al., 2000; Conard, 2002; Conard and Bolus, 2003). Disagreements concern notably the stratigraphic context of the several archaeological assemblages, their chronology and their cultural attribution.

Seven Aurignacian archaeological layers (Fig. 1) were originally defined by Hahn (1988) based on geological observations and the vertical and horizontal distribution of artifacts and features. Following extensive refitting of artifacts and taphonomic analyses, Hahn argued for the existence of two major cultural units (AH II and AH III). This

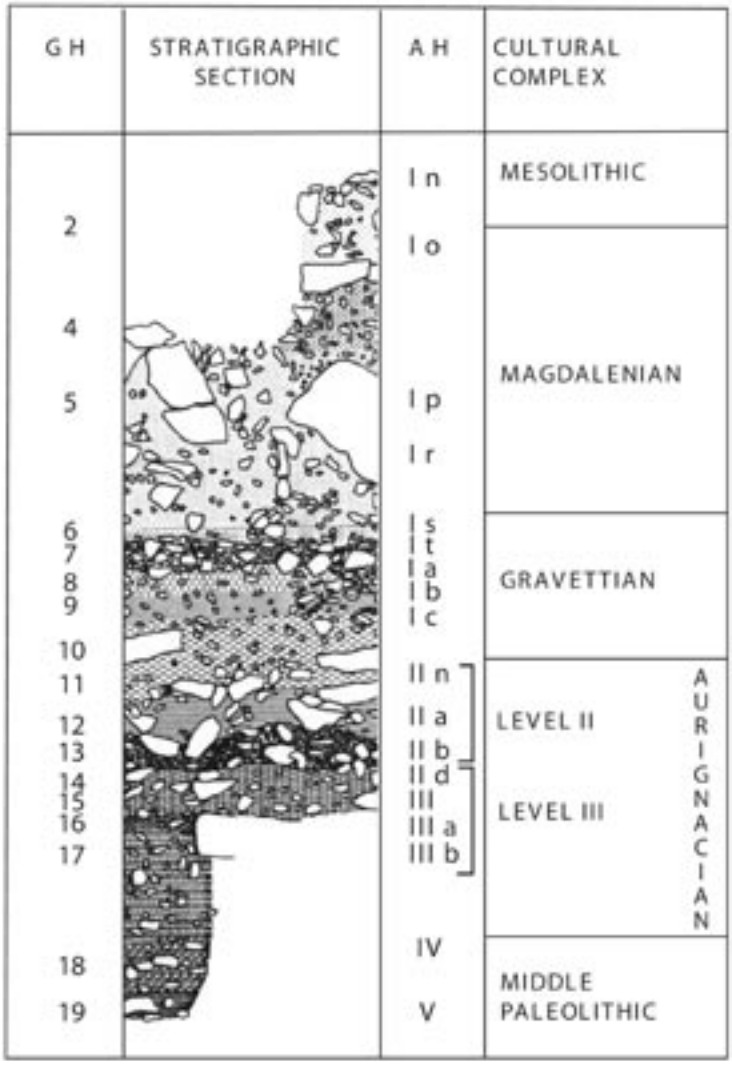


FIG. 1 – Stratigraphic profile of the Geißenklösterle cave (after Hahn, 1988, modified). GH refers to the geological horizons, and AH to the archeological levels.

does not mean that people only came twice to the cave; to the contrary, both Hahn and ourselves argue that the main archaeological horizons II and III reflect several and perhaps many occupations. Spatial analysis suggests that layers IIn and IIa contain artifacts derived from IIb. Similarly, we interpret IId, III, and IIIb as containing secondarily displaced elements of IIIa. Horizon II including IIn, IIa and IIb clearly belongs to the Aurignacian with split-based antler points, mobiliary art, and personal ornaments, while Hahn (1992, 1993) attributed horizon III to the Proto or Pre-Aurignacian. This reconstruction has been contested by Zilhão and d'Errico (1999), who did not accept the integrity and the chrono-cultural attribution of horizon III. Instead, they proposed an alternative hypothesis by which the Aurignacian pieces in horizon III (e.g. carinated pieces, blade technology and personal ornaments) were viewed as the result of contamination from horizon II.

Based on a new taphonomic evaluation of the seven Aurignacian layers of the cave (Teyssandier, 2003), on new refittings (Teyssandier, 2003), on new geoarchaeological and micromorphological analyses (Conard et al., 2003; Dippon, 2003), and on the comparison of lithic and organic productions (Teyssandier and Liolios, 2003), our studies confirm the archeostratigraphic reconstruction by Hahn. We thus attribute AH III to the Early Aurignacian (Teyssandier, 2003), which is directly comparable to similar technical manifestations in the Aquitain basin (e.g. Aurignacian I, Bon, 2002). The Aurignacian pieces such as carinated endscrapers from AH III are not the result of vertical mixing from horizon II. They are clearly concentrated within AH III and originate mainly from archaeological unit IIIa (Fig. 2 and Table 1). The scarcity of vertical mixing from AH II to AH III is confirmed by the stratigraphic position of characteristic organic objects such as split-based antler points or ivory figurines, which always lie within horizon II (Liolios, 1999; Münzel, 1999; Conard et al., 2003; Teyssandier, 2003).

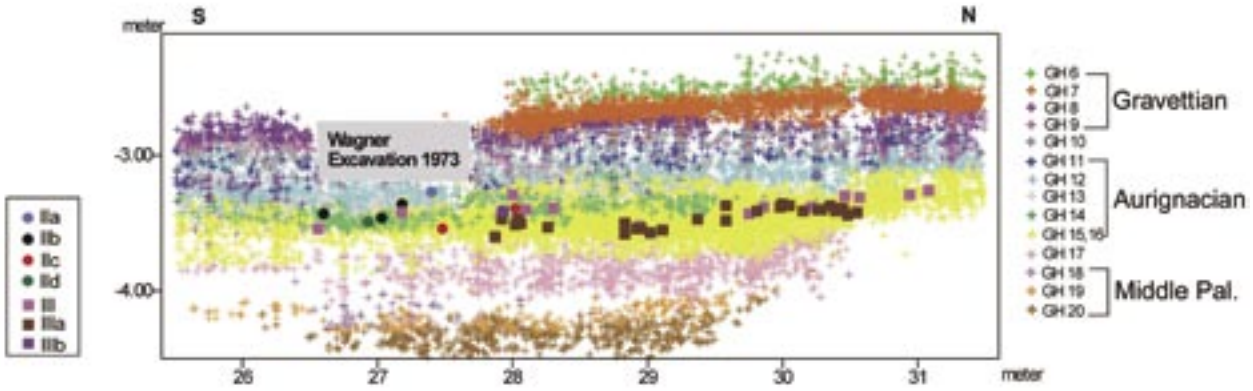


FIG. 2 – Vertical distribution of all the carinated pieces of horizons III and II of Geissenklösterle cave (after Teyssandier, 2003).

TABLE 1

Distribution of all the carinated pieces (including carinated and nosed "endscrapers" and carinated preform cores) in the various levels of the Aurignacian sequence of Geißenklösterle cave (after Teyssandier, 2003).

	IIa	*IIb*	*AH II*	*IId*	*III*	*IIIa*	*IIIb*	*AH III*	*total*
carinated pieces	_	_		1	4	14	_	19	19
nosed pieces	2	2	4	1	8	14	1	24	28
preform	_	1	1	_	_	1		1	2
total	2	3	5	2	12	29	1	44	49

An economic explanation

Our techno-economic work on the lithic (Teyssandier, 2003; Teyssandier and Liolios, 2003) and organic (Liolios, 1999; Teyssandier and Liolios, 2003) productions of the seven Aurignacian subunits casts new light on the debate. AH III is characterized by complete blade reduction sequences, from the first stages of exploitation to the final phases of core discard and tool manufacture. On the other hand, there is scantier evidence of on-site blade production in AH II, since the related reduction sequences are more fragmentary, and cores as well as the initial debitage stages are poorly represented. Additionally, horizon II features a wider range of raw materials than horizon III, a greater use of distant lithic raw materials (Burkert, 1998; Burkert and Floss, 2005), and the introduction of blade blanks and tools produced off-site (Teyssandier, 2003). Both horizons II and III are clearly connected with "evident" and "latent" structures such as an extensive bone and ash lens in IIb and a hearth in IIIa. That is one of the reasons why Hahn (1988) argued that IIb and IIIa were the main occupations of AH II and AH III.

TABLE 2

Distribution of pieces from refitting complex 9 in the various levels of level AH III of Geißenklösterle cave (after Teyssandier, 2003).

A.H.	*number of pieces*
IId	1
III	11
IIIa	16
total	28

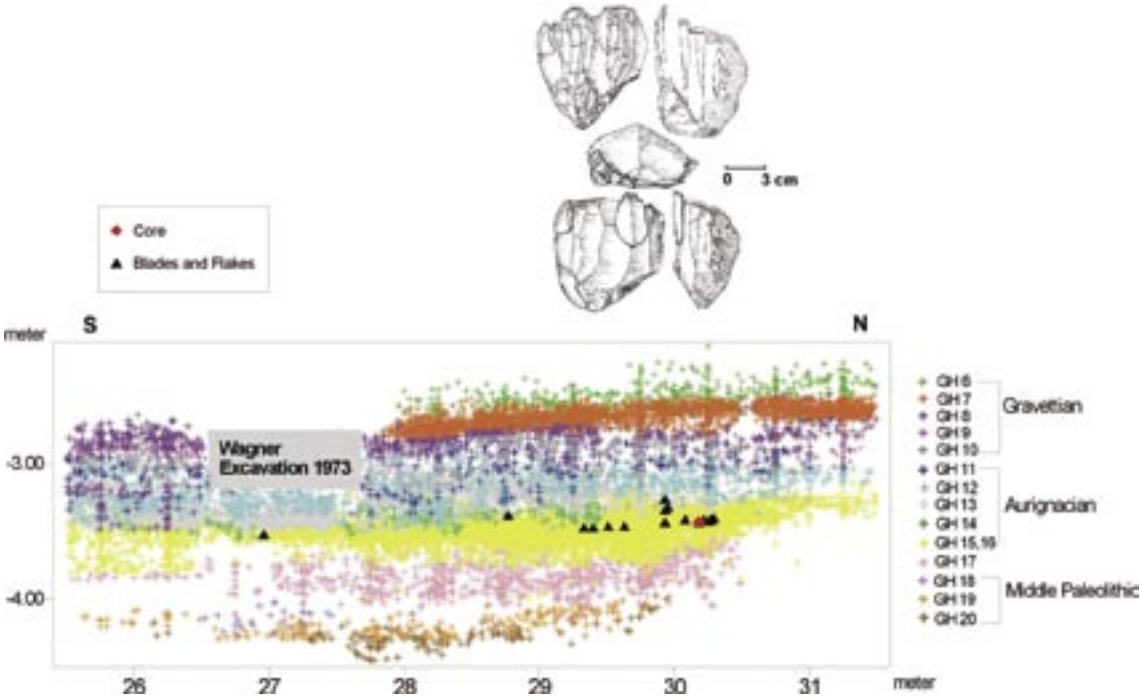


FIG. 3 – Refitting sequence A9 from Geißenklösterle. As indicated in Table 2, most of the refitted pieces were located in IIIa and III (after Conard, 2002).

TABLE 3

Distribution of pieces from refitting complex 11 in the various levels of the Aurignacian sequence of Geißenklösterle cave (after Teyssandier, 2003).

square meter	*number of pieces*
ind.	3
IIb	2
IId	4
III	14
IIIa	44
IIIb	1
total	68

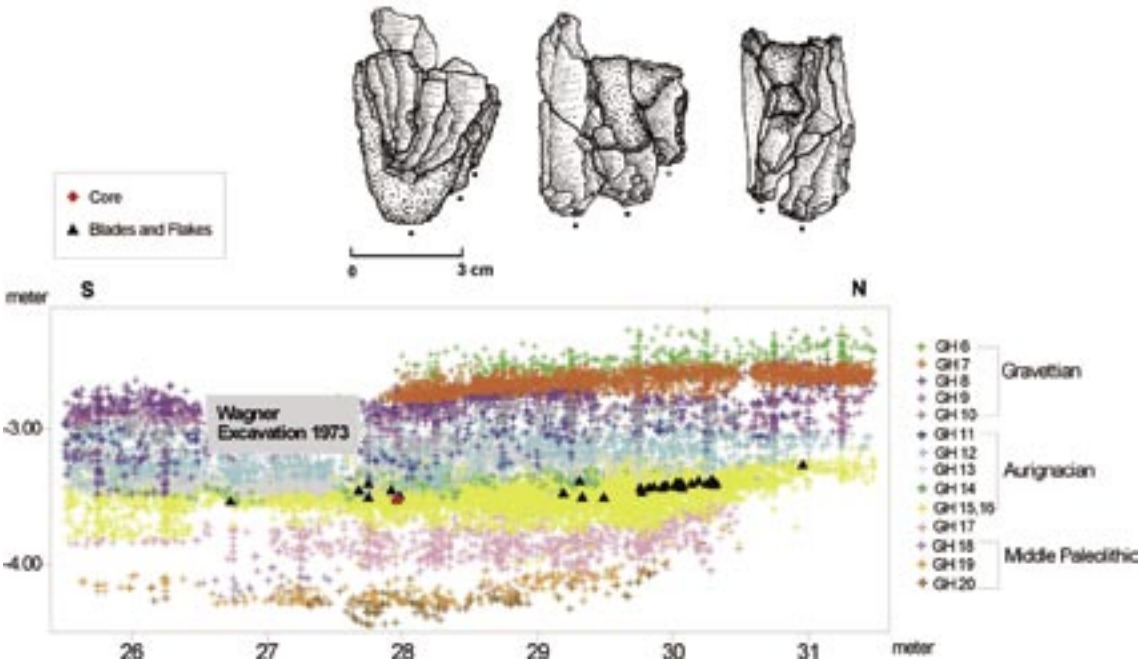


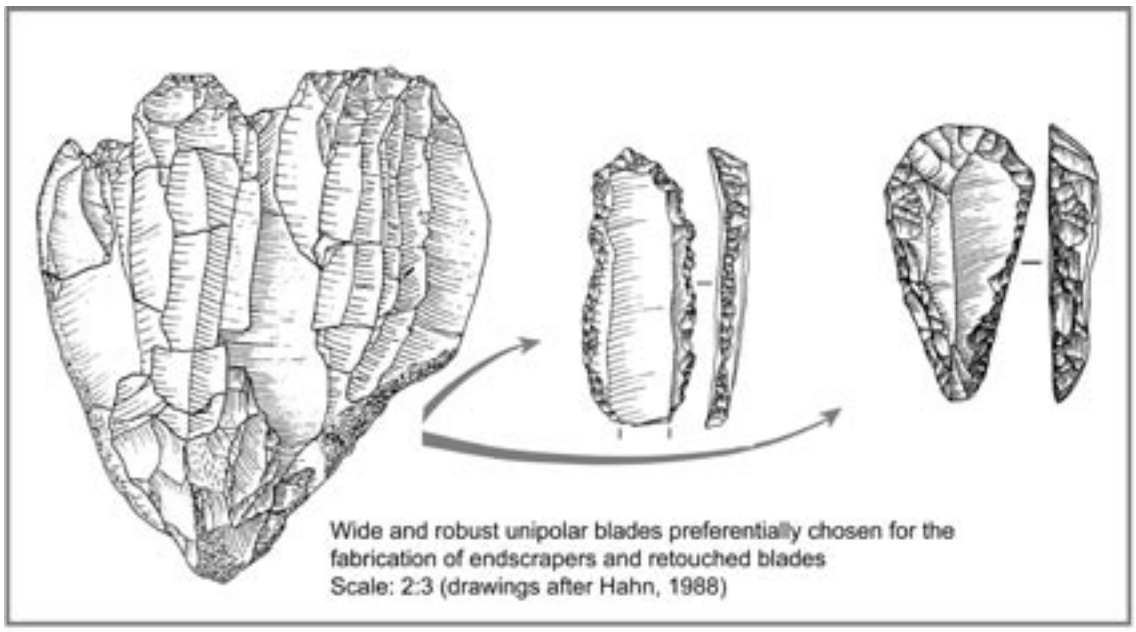
FIG. 4 – Refitting sequence A11 from Geißenklösterle. As indicated in Table 3, most of the reffited pieces were located in IIIa (after Conard, 2002).

This interpretation could be confirmed by the fact that in the area around the hearth, the richest area of AH III, the distribution of refitted artifacts shows a tight spatial patterning in both the horizontal and vertical dimensions. Several blocks were knapped in the area immediately around the hearth as has been demonstrated by lithic refittings (Hahn, 1988; Conard, 2002; Conard and Bolus, 2003; Teyssandier, 2003). Several examples indicate that most of the pieces connected by refittings lie in the area around the hearth. Only a few pieces moved into the overlying layers of horizon II (Figs. 3-4; Tables 2-3). In this case, most of the refitted sequences are clearly related to the hearth of IIIa and give support to the relative integrity of this horizon. Furthermore, the higher proportion of refitting artifacts in horizon III than in horizon II is consistent with the other arguments for the integrity of the deposits. This observation also reflects intensive stone knapping during the formation of AH III. In contrast, due to the economic patterns and the scarcity of on-site primary knapping in AH II, refittings are far less common than in AH III. This being said, the karst dynamic and the related post-depo-

sitional processes help to explain the migration of pieces from horizon III to horizon II, especially in the southern area of the cave. These and the other sources of mixing including excavation error do not refute the validity of the two main archaeological horizons described below.

From a technological perspective, both horizons II and III can be attributed to the Early Aurignacian, which is clearly equivalent to the Aurignacian I in the French nomenclature (Teyssandier, 2003). No major technological differences can be established between these two horizons. The affiliation of AH III to the Early Aurignacian is in contradiction with previous attributions to an Aurignacian preceding the Aurignacian I (Hahn, 1988), to the Proto-Aurignacian (Hahn, 1992, 1993) or Pre-Aurignacian (Kozłowski and Otte, 2000), and with the hypothesis of an assemblage originating from the overlying deposit of AH II (Zilhão and d'Errico, 1999).

In the absence of diagnostic objects such as Dufour bladelets or split-based bone points, the core reduction and the general organization of lithic production are of critical importance



Debitage exclusively oriented towards blade and bladelet productions but related to independent technical processes

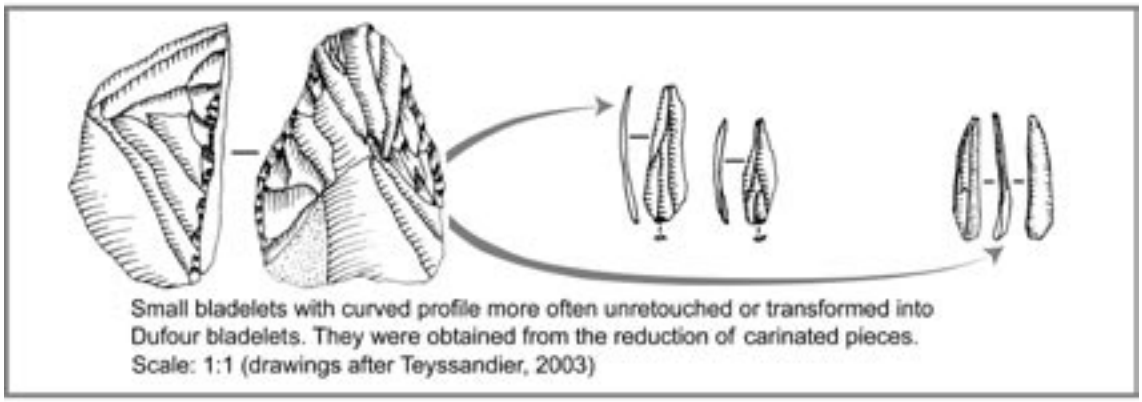


FIG. 5 – Synthetic view on the lithic productions of the Early Aurignacian (AH III and II) of Geißenklösterle cave (after Teyssandier, 2003).

for ascribing AH III to the Early Aurignacian. The lithic production is oriented towards the production of blades and bladelets in using distinct core reduction methods. The blades come from unipolar cores whereas the bladelets are more diversified and obtained predominantly through the exploitation of carinated pieces such as carinated and nosed end-scrapers (Fig. 5). The techniques used for blade and bladelet productions are exactly the same as those recently described in the French Aurignacian I of western Europe (Bon, 2002; Bordes, 2002). The similarity between AH III of Geißenklösterle and the French Aurignacian I is also apparent in the way of obtaining bladelets and in the clear dissociation of blade and bladelet productions.

As a conclusion, horizons II and III are thus culturally similar, but they differ according to economic factors. Such a functional and economic explanation would account for the similarity between the operative concepts identified for the lithic and organic production (Liolios, 1999; Teyssandier, 2003; Teyssandier and Liolios, 2003) in each horizon as well as for the differences in the frequency of tool-types and in the completeness of reduction sequences. In this context, we should recall that in the German research tradition scholars tend to be very cautious in defining cultural sequences. Thus, to date, few attempts have been made to create a fine cultural sequence for the Aurignacian. Analyses by Hahn (1977, 1981) and Bolus (2003) show that there are few if any meaningful cultural subunits within the Aurignacian. Here it is clear that the German tradition emphasizes the role of functional and stochastic variation rather than chrono-stratigraphically defined changes so prevalent in the French Paleolithic tradition.

Geißenklösterle is thus clearly associated with a specific technical tradition now well defined from a techno-economic perspective in southwest France (Bon, 2002) and in the Swabian Jura (Teyssandier, 2003). We may now evaluate, whether or not this tradition exists elsewhere in central Europe.

Willendorf II and its place in the context of the early Upper Paleolithic in central Europe

Willendorf II belongs to a set of Upper Paleolithic sites located on the western bank of the Danube along the Wachau, some 70 km to the west of Vienna. The site was excavated from 1908 to 1927 by Josef Bayer of the Museum of Natural Sciences of Vienna (Felgenhauer, 1956--1959). The excavations revealed the existence of at least nine Paleolithic layers (1 to 9 from the base to the top) in the upper half of loamy deposits about 20 m thick, preserved on the top of a lower terrace of the Danube (Brandtner, 1956-1959; Haesaerts et al., 1996). The lowest cultural layers 1 to 4 are of critical importance in the debate concerning the appearance of Upper Paleolithic industries in central Europe, and they have previously been studied from a typological viewpoint by Felgenhauer (1956-1959), by Broglio and Laplace (1966), and by Hahn (1977).

Cultural layers 1 and 2 are non-diagnostic from a chrono-cultural perspective. The paucity of artifacts and more particularly of diagnostic items make attributions and comparisons extremely difficult (Haesaerts and Teyssandier, 2003; Teyssandier, 2003). Only non-diagnostic tools are found in these assemblages; typical Aurignacian or transitional forms are totally lacking. It is thus impossible to confirm the attribution of layer 2 to the Aurignacian proposed by Broglio and Laplace (1966), or the attribution to the Pre-Aurignacian/Bachokirian proposed by Kozłowski and Otte (2000). The recent hypothesis of Svoboda (2003) to ascribe layer 2 to the Bohunician still remains hypothetical, and it is important to stress that some technical characters recognized in Willendorf II, layer 2, are unknown in the Bohunician tradition (e.g. the use of a soft hammer for blade detachment, Fig. 6, no. 2; Teyssandier, 2003).

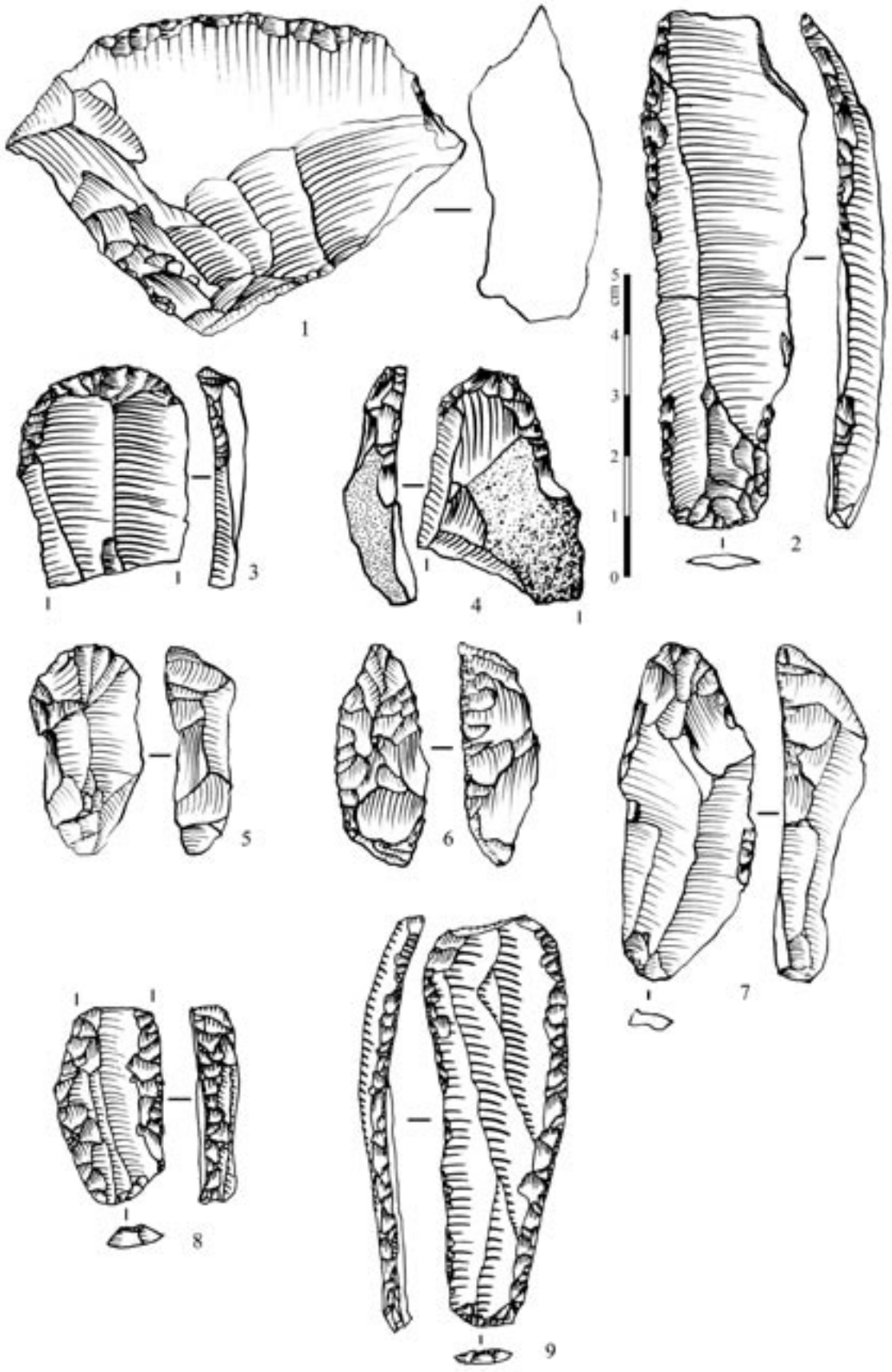


FIG. 6 – Willendorf II, lithic tools from layers 2 (1-4) and 3 (5-9): 1. sidescraper; 2. retouched blade; 3-4. single endscrapers; 5, 7. carinated endscrapers; 6. nosed endscraper; 8-9 retouched blades (after Teyssandier, 2003).

The available lithic assemblage of layer 3 was numerically equivalent to that of layer 2 and consisted of only 38 pieces. However, the morphology of the different tool-types changes: more tools are made on blades, thick endscrapers appear for the first time, and retouched blades are more diversified with two true Aurignacian blades (Fig. 6, nos. 8-9) that are very similar to those usually assigned to the Aurignacian elsewhere. Layer 3 has always been interpreted as Aurignacian (e.g. Felgenhauer, 1956-1959; Broglio and Laplace, 1966; Hahn, 1977, 1993).The chronocultural attribution of Willendorf II, layer 3, depends on the significance attached to some specific tools such as carinated pieces or Aurignacian blades. Concerning the carinated pieces of layer 3 (Fig. 6, nos. 5-7), their aurignacoid character is evident and they are very similar to those documented at Geißenklösterle (Teyssandier, 2003) and in the French Aurignacian I (Bon, 2002). We, however, stress the small number of diagnostic artifacts and the small size of the assemblage, which make comparisons extremely difficult. We need thus to be cautious in using data of layer 3 of Willendorf II in theoretical and global models. Nevertheless, the best points of comparison for layer 3 are found in Early Aurignacian contexts. Recently, several hundred artifacts from layer 3 of Willendorf II have been re-discovered in the cellar of the Department of Prehistory of the Museum of Natural History in Vienna. These artifacts apparently confirm the classification of the Willendorf II, layer 3 assemblage as Aurignacian (Nigst, 2004).

Issues of definition and distribution of Early Aurignacian assemblages in central Europe

When we consider central Europe as a whole, it is necessary to remember the scarcity of well-documented Early Aurignacian stratified assemblages. Here we define the Early Aurignacian not only as a typo-chronological event (e.g. Peyrony's Aurignacian I), but more generally as a specific typo-techno-economic package, which cannot be defined as a pan-European event (Teyssandier, 2003). The Swabian and Austrian data provide some of the best documented evidence of this technological tradition. In moving to a broader spatial scale of analysis, we need to determine the degree to which the social-cultural developments in the Danube Basin are linked to other regions in Europe. This question is of central importance as we work to determine the cultural and demographic processes that occurred at the beginning of the Upper Paleolithic.

If we consider the complexity of technical and socio-symbolic behavior of the inhabitants of sites such as Geißenklösterle, Hohle Fels, Vogelherd or Hohlenstein-Stadel (Bolus, 2003; Conard and Bolus, 2003; Conard et al., 2003) and their temporal affiliation with similar manifestations from the Aquitain Basin, we see both aspects of parallel and contrasting development. The relevant data sets provide to some extent conflicting signatures. On the one hand, organic and inorganic technology documents considerable similarities within Aurignacian assemblages in a wider european context. Here the widespread presence of specific artifacts such as split-based bone points cannot be a matter of independent random discovery. Similarly, patterns of Early Aurignacian lithic reduction and typological variation within lithic assemblages (Hahn, 1977, 1988) also reflect unifying elements between regions. On the other hand, both personal ornaments and diverse forms of figurative art, patterns of decoration and even the evidence for musical traditions, clearly document specific regional signatures (Hahn, 1977, 1986; White, 1993; Vanhaeren, 2002; Conard, 2003; Conard and Bolus, 2003).

Thus, we need to imagine the regions within central Europe, particularly the central Danube and Swabia, as standing in connection with each other and also with neighboring

regions, while at the same time developing local traditions. The similarities in technology and typology argue against seeing central Europe as a desolated and depopulated landscape during the Early Aurignacian. The groups occupying different regions must have had occasional contact to each other to maintain these similarities in the material culture, or at a minimum they maintained shared ancestoral forms of material culture and technologically based behavior. It seems that the most unifying elements in the material culture of the Early Aurignacian reside in technologically and functionally constrained forms, such as projectile points and more or less standardized flint knapping techniques and stone tools. But when we turn to less functionally constrained systems, such as artworks or especially ornaments, for which relatively large assemblages are available, we see sharp contrast in the forms that are well documented in specific regions, eg. Aquitaine (White, 1993) and Swabia (Hahn, 1972, 1995; Conard, 2003, 2005). This pattern of development reflects some of the first examples of regionalization in the archaeological record of the Upper Paleolithic.

From a typological point of view, possible early Aurignacian assemblages are reported, from regions cacluding Moravia (Valoch et al., 1985; Oliva, 1989) and Hungary (Vértes, 1955). Major problems, nevertheless, make it difficult to use this kind of evidence in the debate on the first appearance and development of early Aurignacian industries. The assemblages are sometimes poor and atypical as is the case with the lithics in the Hungarian sites such as Peskö and Istállósk (Hahn, 1977; Svoboda and Simán, 1989). Moreover, with new radiocarbon dates ranging between 28 and 33 kyr BP recently published, Istállósk cave no longer seems to be an appropriate candidate for a very early Aurignacian (Adams and Ringer, 2004). Other sites are richer in material, but they are unstratified, without any chronological context, and may show traces of contamination by non-Aurignacian industries. This might be true for a good portion of the Moravian sites. Keilberg-Kirche near Regensburg in Bavaria, with its presumably old Aurignacian (Uthmeier, 1996), also plays a key role in this discussion. The contextual association and taphonomic setting of the Aurignacian assemblage, however, leave some room to doubt whether the published radiocarbon dates of ca.38 kyr BP on charcoal actually date the human occupation of the site (Zilhão and d'Errico, 1999).

Chronological position of the Early Aurignacian

The interpretation of the best documented Early Aurignacian evidence in central Europe may not be as straightforward as it seems. We argue that, if at Geißenklösterle one only considered ^{14}C AMS results of AH III as a whole, their weighted mean ages would give age estimates around 34 000 BP. However, one has to consider the specific stratigraphic context of the dated materials. Layer IIIa is the major subunit of AH III and corresponds most closely to the main occupations reflected in horizon III. It also contains the best defined archaeological features, most notably a well defined hearth and concentrations of burnt materials and debris of ivory working (Hahn 1988, 1989). This being said, there is every reason to assume that AH III reflects multiple occupations, perhaps spanning long periods of time. Furthermore, as Hahn (1988) and the current authors (Conard and Bolus, 2003) have demonstrated, excavation error and taphonomic mixing have made it difficult to develop a generally valid fine stratigraphy for the site. As a result of the problems with the fine statigraphic resolution, Hahn worked mainly with the macro-stratigraphic horizons II and III. Nonetheless it seems appropriate to consider the dates from layer IIIa first and foremost when evaluating the ^{14}C age estimation of AH III (Teyssandier, 2003). ^{14}C AMS measures of layer IIIa are concentrated between 33 and 35.5 kyr BP, and the dates in this range tend to

have smaller statistical uncertainties. This chronological framework is consistent with the dates obtained from Geißenklösterle bone samples with anthropogenic features and with recently obtained AMS dates from Vogelherd (between 32 and 36 kyr BP for layer V) in a similar cultural context (Conard et al., 2003). The radiocarbon dates from the lower Aurignacian deposits AH IV and Va at Hohle Fels also correspond to this time range (Conard, 2003). Despite at times polemic discourse that would suggest the opposite, this view is in broad agreement with Zilhão and d'Errico's (2003a, 2003b) arguments on the chronology of the Aurignacian (Teyssandier, 2003).

Given the large variation in levels of atmospheric ^{14}C, there is not necessarily a contradiction between the TL results of ca.40 kyr BP ago published by Richter et al. (2000), and the younger estimation presented here and based on the ^{14}C AMS measures (Conard and Bolus, 2003). The time-range 35.5-33 kyr BP is also coherent with the chronological framework of Aurignacian I sites in western Europe. Indeed, in south-west France, most of the ^{14}C dates of Aurignacian I deposits are concentrated between 34 and 32 kyr BP (Bon, 2002, p. 177-179). Central European evidences such as Geißenklösterle AH III are perhaps slightly older, but this can not be proven with certainty in using the available radiocarbon chronology.

Few other sequences can help us to discuss the chronological framework of the early Aurignacian in central Europe. We have already taken great caution in using Willendorf II layer 3 data in the debate. While Willendorf can unquestionably be used as a benchmark in a chronostratigraphic perspective (Damblon et al., 1996; Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003), the small number of published artifacts in cultural layer 3 make comparisons and clear chronocultural assessments difficult (Haesaerts and Teyssandier, 2003; Teyssandier, 2003). This is a very problematic case, since layer 3 is well dated between 38 880 and 37 930 BP (Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003). These dates are uncontroversial, since they were obtained on the same charcoal concentration well identified both in the old excavations and in the 1993 profile cleaning (Haesaerts et al., 1996; Haesaerts and Teyssandier, 2003). We have nevertheless to take into account, that even if Willendorf II cultural layer 3 is accepted as an early Aurignacian occupation, the ^{14}C dates around 38 000 BP were obtained on charcoal samples, whereas the Geißenklösterle chronology relies almost entirely on bone samples. As recently pointed out by Jöris et al. (2003) and Zilhão and d'Errico (1999, 2003a, 2003b), differences exist between dates obtained on bone and charcoal, the latter often yielding older ages than the former.

Outside Swabia and the Wachau, other early Aurignacian assemblages dated around 36--33 000 BP and clearly documented in a techno-economic perspective are lacking in central Europe. It is noteworthy that the Early Aurignacian chronology in central Europe relies almost entirely on Geißenklösterle, the new excavations at Hohle Fels, and more generally on Swabian evidence from well dated sites including Vogelherd and Hohlenstein-Stadel (Hahn, 1977, 1988; Conard, 2003; Conard and Bolus, 2003). This situation is not sufficient to discuss more globally the chronological context of the beginning of the Upper Paleolithic across all of central Europe.

The radiocarbon dates for the Early Aurignacian deposits at Geißenklösterle and other Swabian sites raise important questions about the timing and geographic distribution of the Aurignacian. The issues at hand relate to the fundamental question of whether the Aurignacian has mono- or polycentric origin, and whether or not it is even possible to identify sources of cultural origins. While we agree with Zilhão and d'Errico's (2003a, p. 344) claim that our chronological resolution is in the range of one to five millennia and that the rate of development and spread of cultural characteristics occurs on the order of decades or generations, we

also argue that there is still every reason to work to develop and test models for the demographic and cultural processes of the early Upper Paleolithic.

Recent years have seen such progress in the study of the Aurignacian, that future work should continue to address these questions. Only in the last decade, it has become increasingly clear that the Aurignacian florescence around 40 000 calendar years ago based on TL and around 35 000 radiocarbon years ago saw multiple areas of innovations that produced regional signatures.

Conclusion

This paper raises a number of central questions about the nature of the early Aurignacian. Here we define the Early Aurignacian not only as a chronological stage but more particularly as a technical tradition that includes specific technological patterns, such as lithic core reduction, that is different from roughly contemporaneous traditions such as the Proto-Aurignacian (e.g. Bartolomei et al., 1994; Broglio, 1996, 2000; Kuhn and Stiner, 1998; Bon, 2002). The Early Aurignacian thus includes the classical French Aurignacian I stage characterized by typical organic artifacts such as split-based antler points. Results obtained in central Europe and the Balkans lead to the distinction of at least two distinct "technical" traditions during the early stages of what the scientific community called the Aurignacian (Teyssandier, 2003): the Early Aurignacian described in this paper and the Proto-Aurignacian dominated by large rectilinear bladelets, which are generally transformed into Dufour bladelets. Bon (2002) has already discussed the variability of the early stages of the Aurignacian in southwest France and the western Mediterranean and comes to similar conclusions. He argues for the existence of two "facies": the Archaic Aurignacian (e.g. Proto-Aurignacian) and the Early Aurignacian (e.g. Aurignacien I).

In France, considering the results obtained by Bordes (2002, 2003), the Proto-Aurignacian predates the Early Aurignacian in Le Piage rock-shelter. This could well be the same in the famous site of Isturitz where excavations were recently relaunched (Normand and Turq, in press). The Proto-Aurignacian seems to exist in central Europe, particularly in Krems-Hundssteig, Lower Austria (Broglio and Laplace, 1966; Laplace, 1970; Hahn, 1977), but we have at present little information on its chronological relationship with the Early Aurignacian (Teyssandier, 2003). This is due notably to the absence of well-stratified and recently studied assemblages. Thus, any attempt to develop a taxonomy for the early stages of the Aurignacian is hindered by a lack of reliable data.

The question of the relationships between the Proto- and the Early Aurignacian is far from being resolved. Though they may share certain technical aspects, these two traditions clearly differ in blade and bladelet core reduction (Bon, 2002; Bordes, 2002; Teyssandier, 2003), and in the number and the diversity of their organic tools, ornaments, figurative art, and musical instruments (e.g. Vanhaeren, 2002; Teyssandier, 2003; Liolios, in press; Conard, 2005). In this perspective, the Proto-Aurignacian does not radically deviate from Middle to Upper Paleolithic transitional industries often attributed to the last Neandertals, and its phylogenetic relation with the Early Aurignacian is difficult to define. The term "Aurignacian" in its broader sense thus includes distinct socio-cultural phenomena and is not a pan-European cultural event with a clear single point of origin. For now, both poly- and monogenetic models are plausible. The available data do not clearly demonstrate a unique point of origin for the Aurignacian, perhaps because the speed of the cultural and demographic processes involved is too fast to be isolated with the available data (Teyssandier, 2003; Zilhão and d'Errico, 2003a).

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REFERENCES

ADAMS, B.; RINGER, Á. (2004) - New C^{14} dates for the Hungarian Early Upper Palaeolithic. *Current Anthropology*. Chicago, IL. 45, p. 541-551.

BAR-YOSEF, O. (1998) - On the nature of transitions: the Middle to Upper Palaeolithic and the Neolithic Revolution. *Cambridge Archaeological Journal*. Cambridge. 8, p. 141-163.

BARTOLOMEI, G.; BROGLIO, A.; CASSOLI, P. F.; CASTRELLETTI, L.; CATTANI, L.; CREMASCHI, M.; GIACOBINI, G.; MALERBA, G.; MASPERO, A.; PERESANI, M.; SARTORELLI, A.; TAGLIACOZZO, A. (1994) - La grotte de Fumane. Un site aurignacien au pied des Alpes. *Preistoria Alpina*. Trento. 28, p. 131-179.

BOCQUET-APPEL, J.-P.; DEMARS, P. Y. (2000) - Neanderthal contraction and modern human colonization of Europe. *Antiquity*. Cambridge. 74, p. 544-552.

BOLUS, M. (2003) - The Cultural Context of the Aurignacian of the Swabian Jura. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 153-163.

BOLUS, M. (2004) - Der Übergang vom Mittel- zum Jungpaläolithikum in Europa. Eine Bestandsaufnahme unter besonderer Berücksichtigung Mitteleuropas. *Germania*. Frankfurt am Main. 82, p. 1-54.

BOLUS, M.; CONARD, N. J. (2001) - The late Middle Paleolithic and earliest Upper Paleolithic in Central Europe and their relevance for the Out of Africa hypothesis. *Quaternary International*. Oxford. 75, p. 29-40.

BON, F. (2002) - *L'Aurignacien entre mer et océan: réflexion sur l'unité des phases anciennes de l'Aurignacien dans le Sud de la France*. Paris: Société Préhistorique Française.

BORDES, J.-G. (2002) - *Les interstratifications Châtelperronien/Aurignacien du Roc-de-Combe et du Piage (Lot, France). Analyse taphonomique des industries lithiques; implications archéologiques*. Thèse de doctorat, Université de Bordeaux I.

BORDES, J.-G. (2003) - Lithic taphonomy of the Châtelperronian/Aurignacian interstratifications in Roc de Combe and Le Piage (Lot, France). In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 223-244.

BRANDTNER, F. (1956-1959) - Die geologisch-stratigraphische Position der Kulturschichten von Willendorf i. d. Wachau, N. Ö. In FELGENHAUER, F. - *Willendorf in der Wachau. Monographie der Paläolith-Fundstellen I-VII*. Wien: R. M. Rohrer (Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften; 8-9), p. 173-198.

BROGLIO, A. (1996) - The appearance of modern humans in Europe: the archaeological evidence from the mediterranean regions. In PIPERNO, M.; BAR-YOSEF, O.; CAVALLI-SFORZA, L. L., eds - *The origin of modern man*. XIII International Congress of Prehistoric and Protohistoric Sciences, Forlí, Coll. X. Forlí: A.B.A.C.O., p. 237-249.

BROGLIO, A. (2000) - Considerations on the Aurignacian industries from Krems-Hundssteig in the Middle Danube basin and Fumane in the Adige basin. In MESTER, Z.; RINGER, Á., eds., - *A la recherche de l'homme préhistorique*. Liège: Université (Études et Recherches Archéologiques de l'Université de Liège-ERAUL; 95), p. 311-320.

BROGLIO, A; LAPLACE, G. (1966) - Études de typologie analytique des complexes leptolithiques de l'Europe centrale I. Les complexes aurignacoïdes de la Basse-Autriche. *Rivista di Scienze Preistoriche*. Firenze. 21, p. 61-121.

BURKERT, W. (1998) - *Lithische Rohmaterialversorgung im Jungpaläolithikum des südöstlichen Baden-Württemberg*. Doctoral Dissertation University of Tübingen.

BURKERT, W.; FLOSS, H. (2005) - Lithic exploitation areas in the Upper Paleolithic of west and southwest Germany: a comparative study. In WEISGERBER, G.; KÖRLIN, G., eds. - *Stone Age – Mining Age. Proceedings of the VIIIth International Flint Symposium Bochum 1999*. Der Ausschnitt. Beiheft 19, p. 35-39.

CONARD, N. J. (2002) - The timing of cultural innovations and the dispersal of modern humans in Europe. In BRAUER, A.; NEGENDANK, J. F. W.; BOHM, M., eds. - *Proceedings of the DEUQUA-Meeting August 26-28, 2002 Potsdam, Germany. Terra Nova*. Oxford. 2002/6, p. 82-94.

CONARD, N. J. (2003) - Palaeolithic ivory sculptures from southwestern Germany and the origins of figurative art. *Nature*. London. 426, p. 830-832.

CONARD, N. J. (2005). - Aurignacian art in Swabia and the beginnings of figurative representations in Europe. In BROGLIO, A; DALMERI, G., eds. - *Pitture Paleolitiche nelle Prealpi Venete. Grotta di Fumane e Riparo Dalmeri*. Memorie del Museo di Storia Naturale di Verona - 2.ª Serie, Sezione Scienze dell'Uomo 9. Preistoria Alpina, Nr. Speciale. Verona: Museo Civico di Storia Naturale di Verona - Museo Tridentino di Scienze Naturali, p. 82-88.

CONARD, N. J.; BOLUS, M. (2003) - Radiocarbon dating the appearance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution*. London. 44, p. 331-371.

CONARD, N. J.; DIPPON, G.; GOLDBERG, P. (2003) - Chronostratigraphy and archeological context of the Aurignacian deposits at Geißenklösterle. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 165-176.

CONARD, N. J.; NIVEN, L. B.; MUELLER, K.; STUART, A. J. (2003) - The Chronostratigraphy of the Upper Paleolithic deposits at Vogelherd. *Mitteilungen der Gesellschaft für Urgeschichte*. Blaubeuren. 12, p. 73-86.

DAMBLON, F.; HAESAERTS, P.; VAN DER PLICHT, J. (1996) - New datings and considerations on the chronology of Upper Palaeolithic sites in the Great Eurasiatic Plain. *Préhistoire Européenne*. Liège. 9, p. 177-231.

DAVIES, W. (2001) - A very model of a modern human industry: new perspectives on the origins and spread of the Aurignacian in Europe. *Proceedings of the Prehistoric Society*. London. 67, p. 195-217.

DIPPON, G. (2003) - *Die Taphonomie der Aurignacienhorizonte der Geißenklösterle-Höhle bei Blaubeuren*. MA Thesis, University of Tübingen.

DJINDJIAN, F. (1993) - Les origines du peuplement aurignacien en Europe. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche Orient. Actes du XII^e Congrès International des Sciences Préhistoriques et Protohistoriques. Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 136-154.

DROBNIEWICZ, B.; GINTER, B.; KAZIOR, B.; KOZŁOWSKI, J. K. (2000) - Early Upper Palaeolithic assemblages from layer 4, trench TD-I. In GINTER, B.; KOZŁOWSKI, J. K.; GUADELLI, J.-L.; LAVILLE, H. - *Temnata Cave. Excavations in Karlukovo Karst Area, Bulgaria*, vol. 2, part 1. Kraków: Uniwersytet Jagielloński, p. 333-418.

FELGENHAUER, F. (1956-1959) - *Willendorf in der Wachau. Monographie der Paläolith-Fundstellen I-VII*. 3 vols., with contributions by F. Brandtner; A. Papp; E. Thenius; E. Zirkl.. Wien: R. M. Rohrer (Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften; 8-9).

GINTER, B.; KOZŁOWSKI, J. K.; LAVILLE, H.; SIRAKOV, N.; HEDGES, R. E. M. (1996) - Transition in the Balkans: news from the Temnata Cave, Bulgaria. In CARBONELL, E.; VAQUERO, M., eds. - *The last Neandertals, the first anatomically modern humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40 ka BP*. Tarragona: Universitat Rovira i Virgili, p. 169-200.

HAESAERTS, P.; DAMBLON, F.; BACHNER, M.; TRNKA, G. (1996) - Revised stratigraphy and chronology of the Willendorf II sequence, Lower Austria. *Archaeologia Austriaca*. Wien. 80, p. 25-42.

HAESAERTS, P.; TEYSSANDIER, N. (2003) - The early Upper Paleolithic occupations of Willendorf II (Lower Austria): a contribution to the chronostratigraphic and cultural context of the beginning of the Upper Paleolithic in Central Europe. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 133-151.

HAHN, J. (1972) - Aurignacian signs, pendants and art objects in Central and Eastern Europe. *World Archaeology*. London. 3, p. 252-266.

HAHN, J. (1977) - *Aurignacien, das ältere Jungpaläolithikum in Mittel- und Osteuropa*. Köln-Wien: Böhlau (Fundamenta; A 9).

HAHN, J. (1981) - Abfolge und Umwelt der jüngeren Altsteinzeit in Südwestdeutschland. *Fundberichte aus Baden-Württemberg*. Stuttgart. 6, p. 1-27.

HAHN, J. (1986) - *Kraft und Aggression. Die Botschaft der Eiszeitkunst im Aurignacien Süddeutschlands?*. Tübingen: Verlag Archaeologica Venatoria (Archaeologica Venatoria; 7).

HAHN, J. (1988) - *Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien*. Stuttgart: Theiss.

HAHN, J. (1989) - Zur Funktion einer Aurignacien-Feuerstelle aus dem Geißenklösterle bei Blaubeuren. *Fundberichte aus Baden-Württemberg*. Stuttgart. 14, p. 1-22.

HAHN, J. (1992) - Die Ausgrabungen 1991 im Geißenklösterle bei Blaubeuren, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg 1991*. Stuttgart. p. 19-21.

HAHN, J. (1993) - L'origine du Paléolithique supérieur en Europe Centrale: Les datations C^{14}. In CABRERA VALDÉS, V., ed. - *El origen del hombre moderno en el Suroeste de Europa*. Madrid: Universidad Nacional de Educación a Distancia, p. 61-80.

HAHN, J. (1995a) - Neue Beschleuniger ^{14}C-Daten zum Jungpaläolithikum in Südwestdeutschland. *Eiszeitalter und Gegenwart*. Hannover. 45, p. 86-92.

HAHN, J. (1995b) - Les ivoires en Allemagne: débitage, façonnage et utilisation au Paléolithique supérieur. In HAHN. J.; MENU, M.; TABORIN, Y.; WALTER, P.; WIDEMANMN, F., eds. - *Le travail et l'usage de l'ivoire au Paléolithique supérieur*. Ravello: Istituto Poligrafico e Zecca dello Stato, Libreria dello Stato, p. 115-135.

JÖRIS, O.; ÁLVAREZ FERNÁNDEZ, E.; WENINGER, B. (2003) - Radiocarbon evidence of the Middle to Upper Palaeolithic transition in Southwestern Europe. *Trabajos de Prehistoria*. Madrid. 60:2, p. 15-38.

KOZŁOWSKI, J. K., ed. (1982) - *Excavation in the Bacho Kiro Cave (Bulgaria): final report*. Warszawa: Państwowe Wydawnictwo Naukowe.

KOZŁOWSKI, J. K. (1993) - L'Aurignacien en Europe et au Proche-Orient. In BÁNESZ, L.; KOZŁOWSKI, J. K., eds. - *Aurignacien en Europe et au Proche-Orient. Actes du XII^{ème} Congrès International des Sciences Préhistoriques et Protohistoriques, Bratislava, 1-7 septembre 1991*. Nitra-Bratislava: Institut Archéologique de l'Académie Slovaque des Sciences, p. 283-291.

KOZŁOWSKI, J. K. (1999) - The evolution of the Balkan Aurignacian. In DAVIES, W.; CHARLES, R., eds. - *Dorothy Garrod and the progress of the Palaeolithic: studies in the Prehistoric Archaeology of the Near East and Europe*. Oxford: Oxbow, p. 97-117.

KOZŁOWSKI, J. K.; OTTE, M. (2000) - The formation of the Aurignacian in Europe. *Journal of Anthropological Research*. Albuquerque, NM. 56, p. 513-534.

KUHN, S. L.; STINER, M. C. (1998) - The Earliest Aurignacian of Riparo Mochi (Liguria, Italy). *Current Anthropology*. Chicago, IL. 39 (suppl. 1), p. S175-S189.

LAPLACE, G. (1970) - *L'industrie de Krems-Hundssteig et le problème de l'origine des complexes aurignaciens*. In GRIPP, K.; SCHÖTRUMPF, R.; SCHWABEDISSEN, H., eds - *Frühe Menscheit und Umwelt*. Teil I: Archäologische Beiträge. Köln--Wien: Böhlau (Fundamenta; A2), p. 242-288.

LIOLIOS, D. (1999) - *Variabilité et caractéristiques du travail des matières osseuses au début de l'aurignacien: approche technologique et économique*. Thèse de doctorat de l'Université Paris X-Nanterre.

LIOLIOS, D. (in press) - Les productions osseuses de l'Aurignacien ancien pyrénéen. *Annales de la Fondation Fyssen*. Paris.

MELLARS, P. A. (1989) - Major issues in the emergence of modern humans. *Current Anthropology*. Chicago, IL. 30, p. 349-385.

MELLARS, P. A. (1996a) - Models for the dispersal of anatomically modern populations across Europe: theoretical and archaeological perspectives. In PIPPERNO, M.; BAR-YOSEF, O.; CAVALLI-SFORZA, L. L., eds. - *The origin of modern man. Colloquium X, XIII International Congress of U.I.S.P.P., Forlí*. Forlí: A.B.A.C.O., p. 225-235.

MELLARS, P. A. (1996b) - *The Neanderthal legacy. An archaeological perspective from Western Europe*. Princeton, NJ: Princeton University Press.

MELLARS, P. A. (2004) - Neanderthals and the modern human colonization of Europe. *Nature*. London. 432, p. 461-465.

MÜNZEL, S. (1999) - *DFG-Abschlußbericht zur Großsäugerfauna aus dem Geißenklösterle*. Tübingen: unpublished manuscript.

NIGST, P. R. (2004) - *The first modern humans in the Middle Danube Area: new evidence from Eastern Austria*. Poster presented at the round table 'Neanderthals and Modern Humans Meet?' in Blaubeuren, July 2004.

NORMAND, Ch.; TURQ, A. (in press) - L'Aurignacien de la grotte d'Isturitz (France): la production lamellaire dans la séquence de la salle Saint-Martin. In LE BRUN-RICALENS, F., ed. - *Productions lamellaires attribuées à l'Aurignacien: chaînes opératoires et perspectives techno-culturelles*. Liège: Symposium 6-7, XV^{e} Congrès de l'UISPP, 2-8 Septembre 2001. Université de Liège.

OLIVA, M. (1989) - The early Aurignacian industry from Vedrovice II (Southern Moravia) and the question of the Aurignacian origins. *Anthropologie*. Paris. 27, p. 251-264.

OTTE, M. (1990) - From the Middle to the Upper Paleolithic: the nature of the transition. In MELLARS, P. A., ed. - *The emergence of modern humans: an archaeological perspective*. Edinburgh: Edinburgh University Press, p. 438-456.

OTTE, M. (1996) - Le bouleversement de l'humanité en Eurasie vers 40.000 ans. In CARBONELL, E.; VAQUERO, M., eds. - *The last Neandertals, the first anatomically modern humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40 ka BP*. Tarragona: Universitat Rovira i Virgili, p. 95-106.

RICHTER, D.; WAIBLINGER, J.; RINK, W. J.; WAGNER, G. A. (2000) - Thermoluminescence, Electron Spin Resonance and ^{14}C-dating of the Late Middle and Early Upper Palaeolithic Site of Geißenklösterle Cave in Southern Germany. *Journal of Archaeological Science*. London. 27, p. 71-89.

SVOBODA, J. (2003) - The Bohunician and the Aurignacian. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the A*
of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001). Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 123-131.

SVOBODA, J.; SIMÁN, K. (1989) - The Middle-Upper Paleolithic transition in Southeastern Central Europe (Czechoslovakia and Hungary). *Journal of World Prehistory*. New York, NY. 3, p. 283-322.

TEYSSANDIER, N. (2003) - *Les débuts de l'Aurignacien en Europe. Discussion à partir des sites de Geissenklösterle, Willendorf II, Krems-Hundssteig et Bacho Kiro*. Thèse de doctorat, Université de Paris X-Nanterre.

TEYSSANDIER, N.; LIOLIOS, D. (2003) - Defining the earliest Aurignacian in the Swabian Alp: the relevance of the technological study of the Geissenkösterle (Baden-Würtenberg, Germany) lithic and organic productions. In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 179-196.

UTHMEIER, T. (1996) - Ein bemerkenswert frühes Inventar des Aurignacien von der Freilandfundstelle „Keilberg-Kirche" bei Regensburg. *Archäologisches Korrespondenzblatt*. Mainz am Rhein. 26, p. 233-248.

VALOCH, K.; OLIVA, M.; HAVLÍČEK, P.; KARÁSEK, J.; PELÍŠEK, J.; SMOLÍKOVÁ, L. (1985). - Das Frühaurignacien von Vedrovice II und Kupa ovice I in Südmähren. *Anthropozoikum*. Praha. 16, p. 107-203.

VANHAEREN, M. (2002) - *Les fonctions de la parure au Paléolithique supérieur; de l'individu à l'unité culturelle*. Thèse de doctorat, Université de Bordeaux I.

VÉRTÈS, L. (1955) - Neue Ausgrabungen und paläolithische Funde in der Höhle von Istállóskö. *Acta Archaeologica Academiae Scientiarium Hungaricae*. Budapest. 5, p. 111-131.

WHITE, R. (1993) - Technological and social dimension of "Aurignacian-age" body ornaments across Europe. In KNECHT, H.; PIKE-TAY, A.; WHITE, R., eds. - *Before Lascaux: the complex record of the Early Upper Paleolithic*. Boca Raton, FA: CRC Press, p. 277-299.

ZILHÃO, J.; D'ERRICO, F. (1999) - The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neandertal extinction. *Journal of World Prehistory*. New York, NY. 13:1, p. 1-68.

ZILHÃO, J.; D'ERRICO, F. (2003a) - The chronology of the Aurignacian and transitional technocomplexes. Where do we stand? In ZILHÃO, J.; D'ERRICO, F., eds. - *The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001)*. Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), p. 313-349.

ZILHÃO, J.; D'ERRICO, F. (2003b) - An Aurignacian "Garden of Eden" in Southern Germany? An alternative interpretation of the Geißenklösterle and a critique of the *Kulturpumpe* model. *Paléo*. Les Eyzies-de-Tayac. 15, p. 69-86.